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GB A 2004445
GB 1208736
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US 4210785
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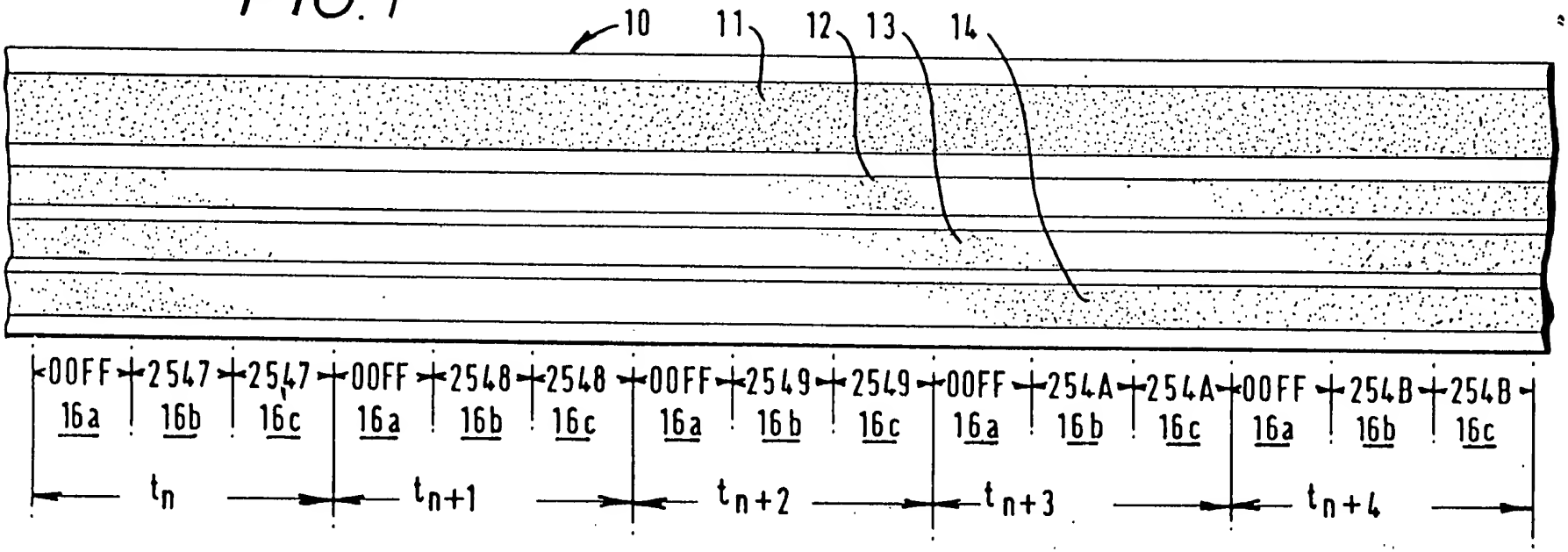
(54) Improvements in or relating to video tape players and pre-recorded cassettes therefor

(57) A coin operated video tape player or video juke box retrieves and plays on a monitor information streams recorded in a video track and a first audio track at spaced locations along the tape. A control unit memorises the start and stop position of each selection along the tape. In fast forward or rewind to the start of a selected information stream the control unit uses control track pulses to monitor tape movement but when in normal play it receives and decodes frequency shift keyed tones recorded in a second audio track and defining digitally encoded incrementally numbered positions along the tape. When the required selection has been reached, the input to the monitor is switched from a continuously available source such as graphics recorded in a read-only memory to the output from the tape player. Wallboxes connected in a ring to the control unit provide for remote selection entry and the machine may be arranged to play certain selections under the command of a programable timer controlled by a real-time clock. Simultaneous operation of two tape players is also possible with one player in normal play where the other player is accessing the required selection.

GB 2 122 799 A

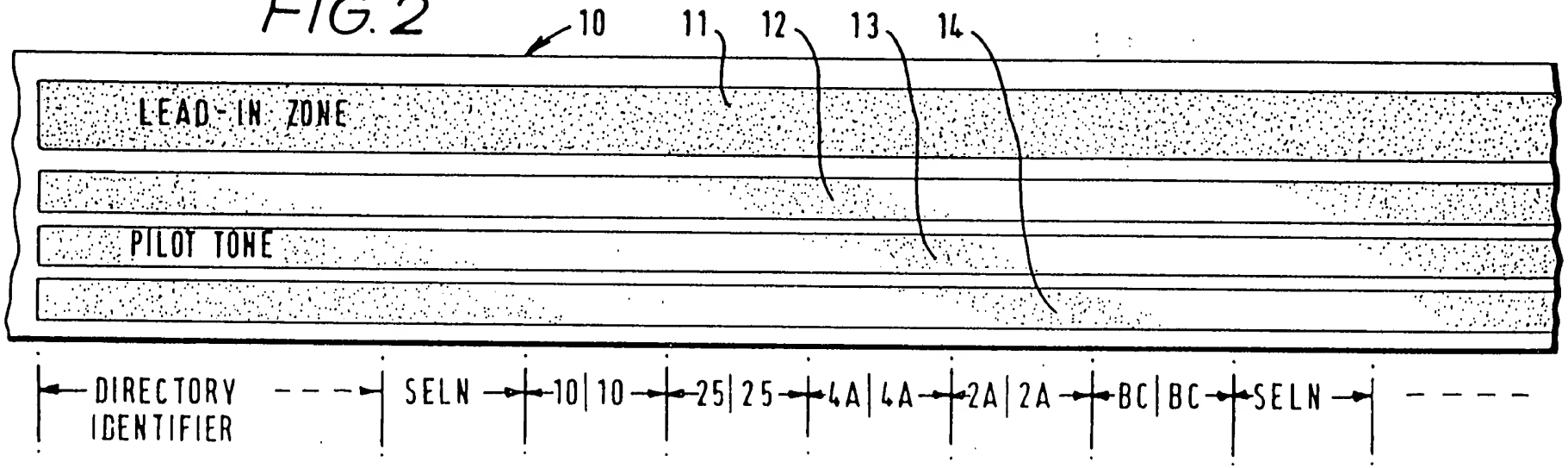
The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG. 1



1/9

FIG. 2



2122790

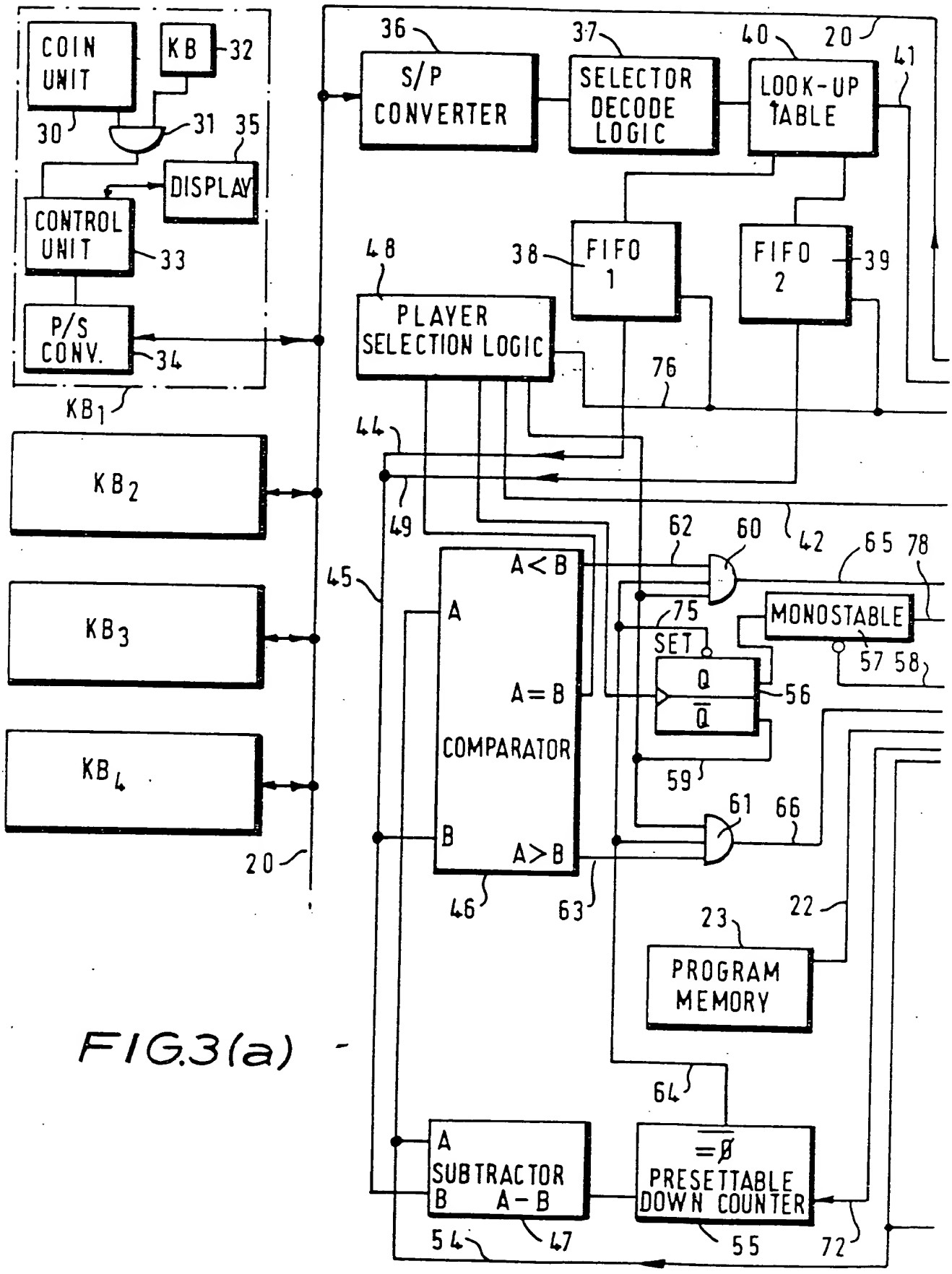

COIN UNIT
KB
32
30
31
35
DISPLAY
CONTROL UNIT
33
P/S CONV.
34
KB1
KB2
KB3
KB4
20
36
S/P CONVERTER
37
SELECTOR DECODE LOGIC
40
20
LOOK-UP TABLE
41
48
PLAYER SELECTION LOGIC
38
FIFO 1
FIFO 2
39
76
44
49
42
62
60
65
78
45
A<B
A
A=B
COMPARATOR
B
A>B
75
SET
MONOSTABLE
57
58
Q
Q̄
56
59
61
66
46
63
23
22
PROGRAM MEMORY
64
A
SUBTRACTOR
B
A-B
=β
PRESETTABLE DOWN COUNTER
54
47
55
72

FIG.3(a)

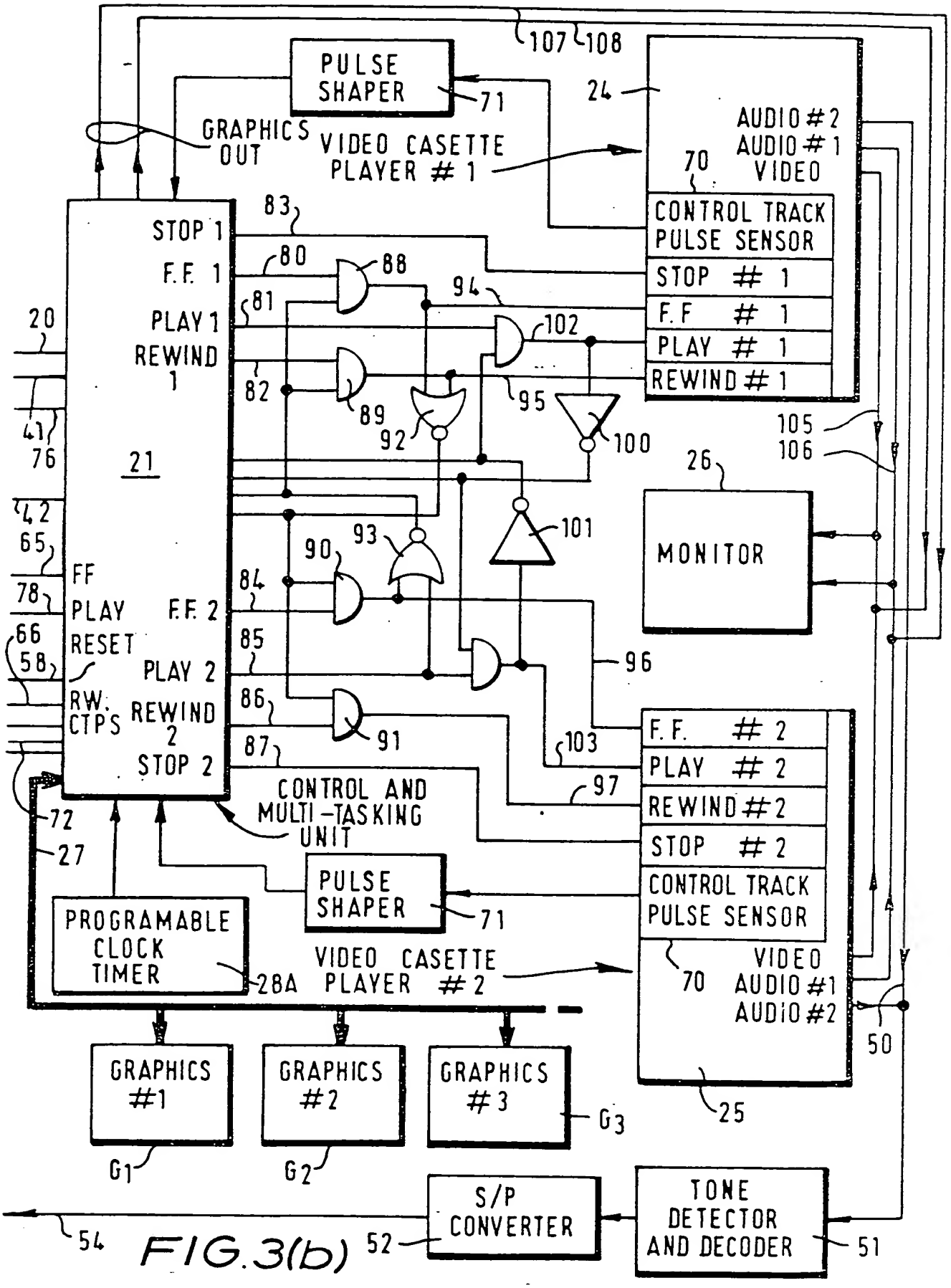

PULSE SHAPER
71
GRAPHICS OUT
VIDEO CASETTE PLAYER # 1
24
AUDIO #2
AUDIO #1
VIDEO
70
CONTROL TRACK PULSE SENSOR
STOP # 1
F.F # 1
PLAY # 1
REWIND # 1
107
108
105
106
STOP 1
F.F. 1
PLAY 1
REWIND 1
FF PLAY RESET
F.F. 2
PLAY 2
RW. CTPS
REWIND 2
STOP 2
21
20
41
76
42
65
78
66
58
72
27
83
80
81
82
88
89
92
94
95
102
100
101
93
90
84
85
86
91
87
96
97
103
26
MONITOR
F.F. # 2
PLAY # 2
REWIND #2
STOP # 2
CONTROL TRACK PULSE SENSOR
VIDEO AUDIO #1 AUDIO #2
70
25
50
CONTROL AND MULTI-TASKING UNIT
PULSE SHAPER
71
PROGRAMABLE CLOCK TIMER
28A
VIDEO CASETTE PLAYER # 2
GRAPHICS #1
GRAPHICS #2
GRAPHICS #3
G1
G2
G3
S/P CONVERTER
52
TONE DETECTOR AND DECODER
51
54

FIG.3(b)

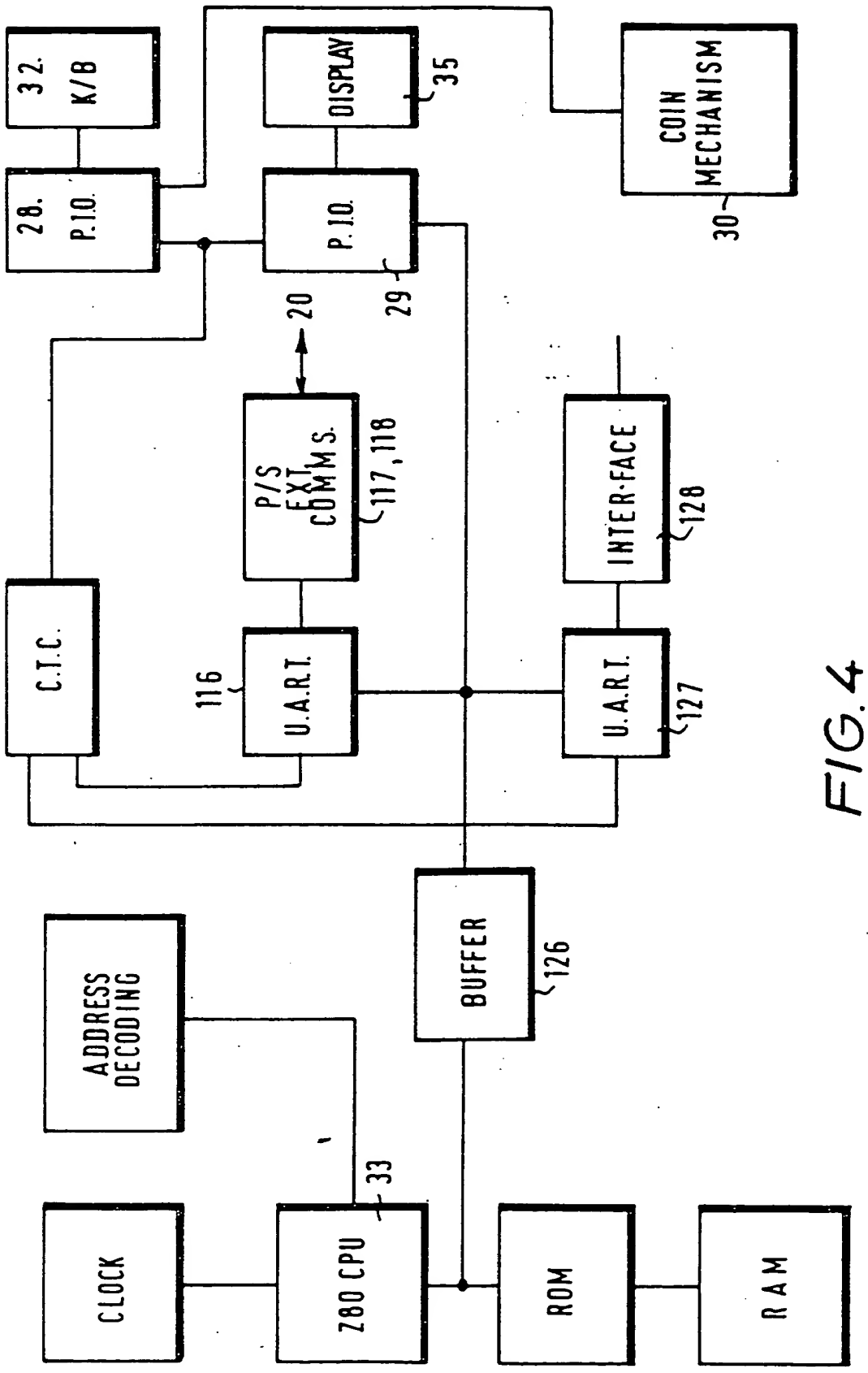

32.
K/B
DISPLAY
35
COIN
MECHANISM
28.
P.I.O.
P.I.O.
30
29
20
P/S
EXT.
COMMS.
117, 118
INTER-FACE
128
C.T.C.
116
U.A.R.T.
U.A.R.T.
127
BUFFER
126
ADDRESS
DECODING
CLOCK
Z80 CPU
33
ROM
RAM

FIG.4

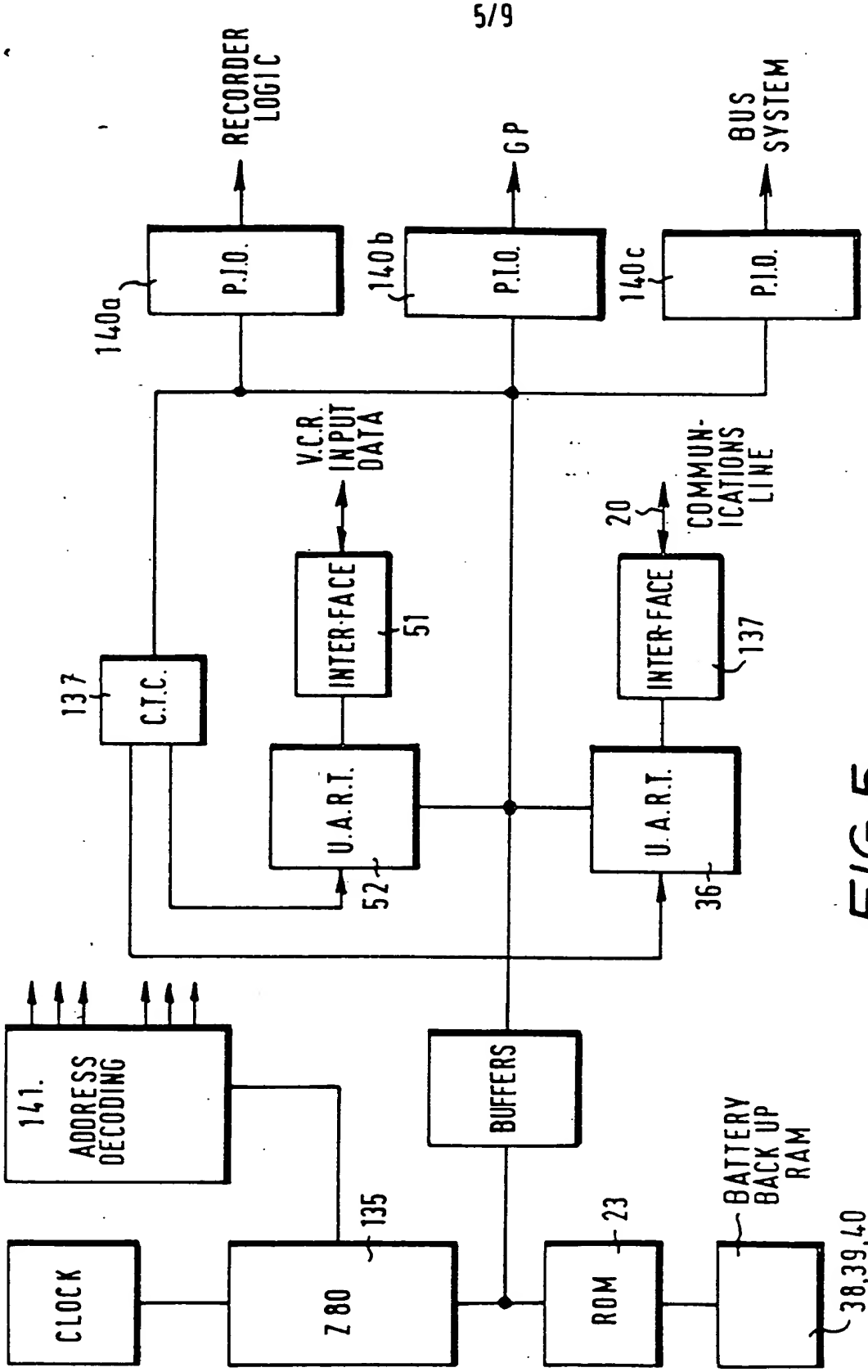

RECORDER LOGIC
G P
BUS SYSTEM
140a
P.I.O.
140b
P.I.O.
140c
P.I.O.
V.C.R. INPUT DATA
COMMUN-ICATIONS LINE
20
INTER-FACE
51
INTER-FACE
137
137
C.T.C.
U.A.R.T.
52
U.A.R.T.
36
141.
ADDRESS DECODING
BUFFERS
BATTERY BACK UP RAM
CLOCK
Z 80
135
ROM
23
38,39,40

FIG.5

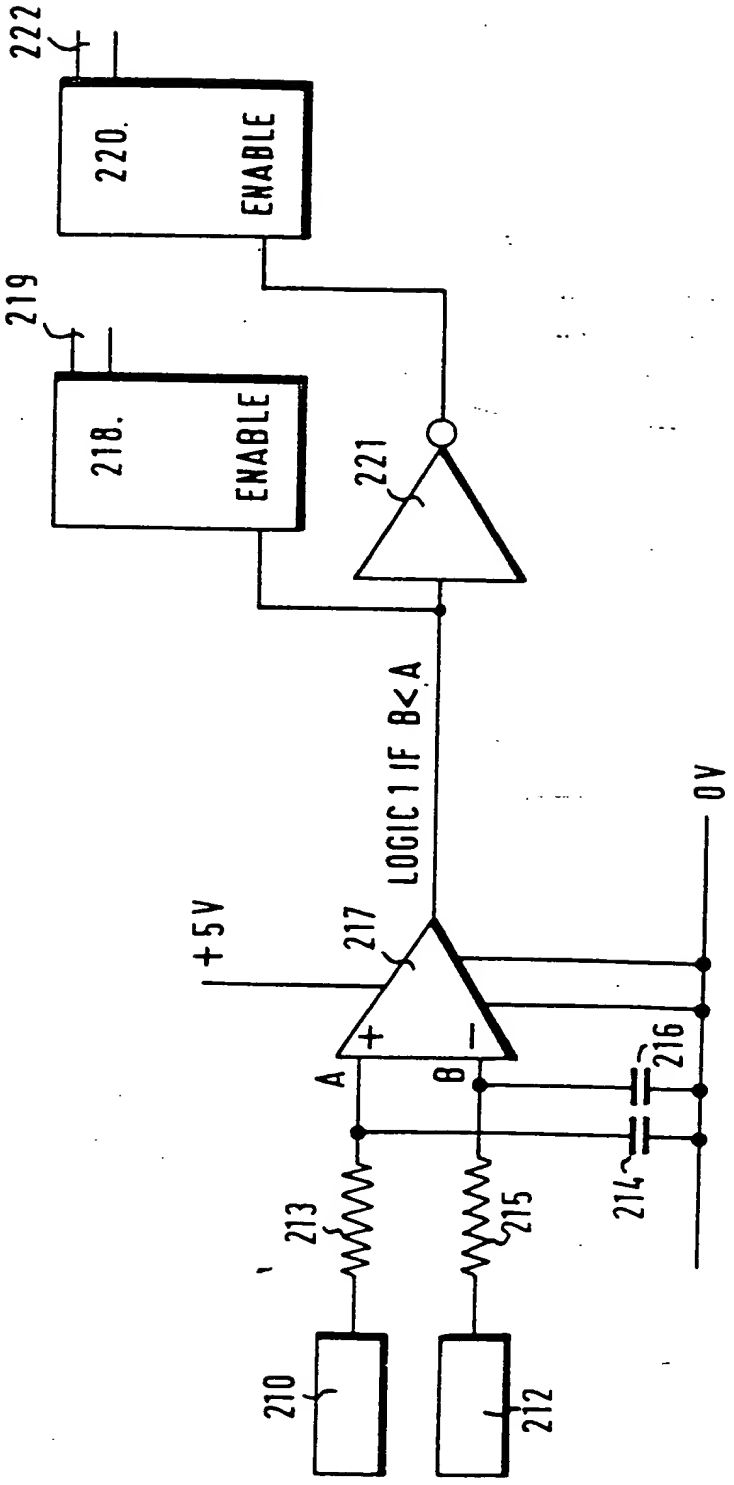

222
220.
ENABLE
219
218.
ENABLE
221
LOGIC 1 IF B<A
+5V
0V
217
+
−
A
B
216
214
213
215
210
212

FIG.6

FIG.7

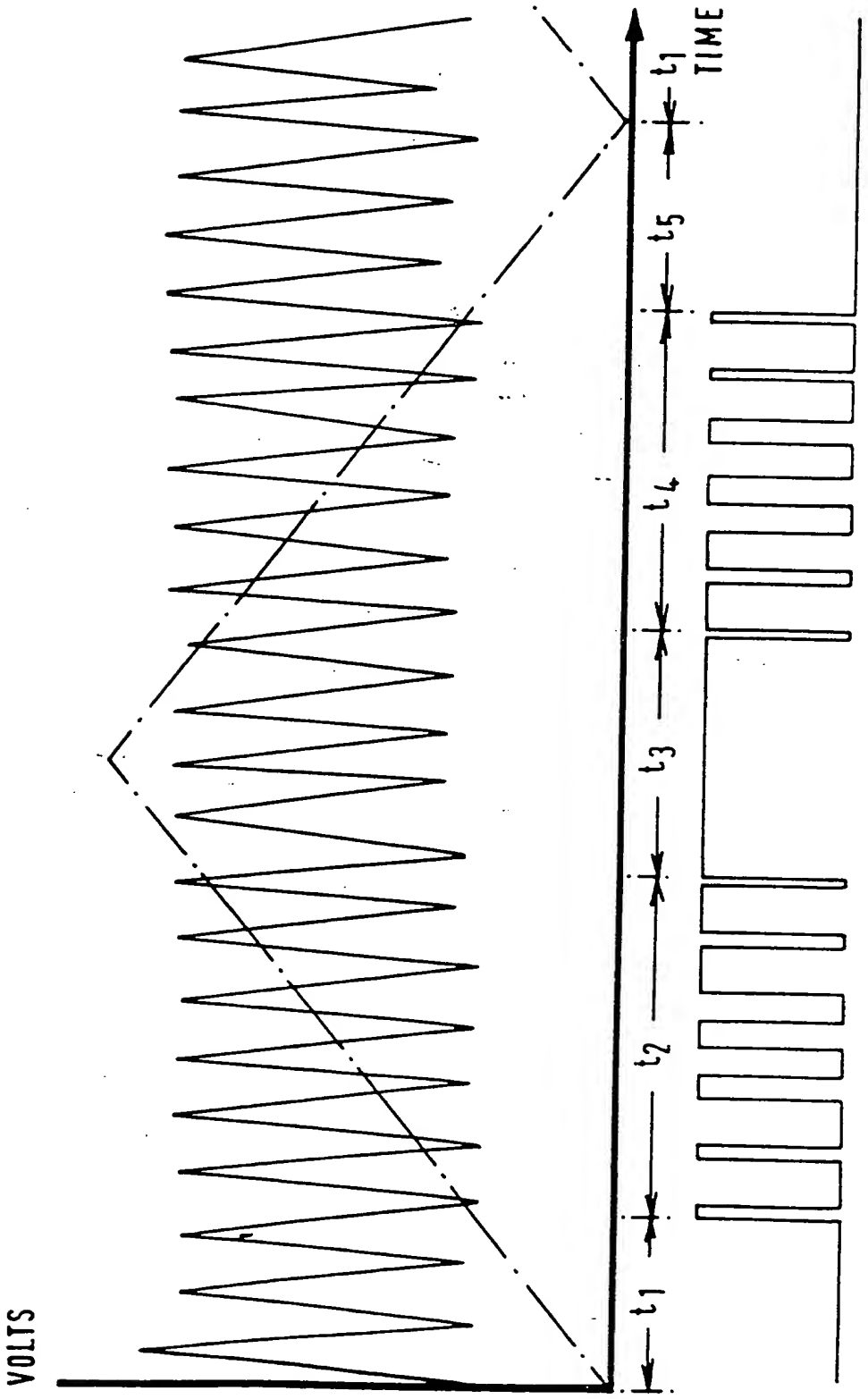


FIG.8(a)

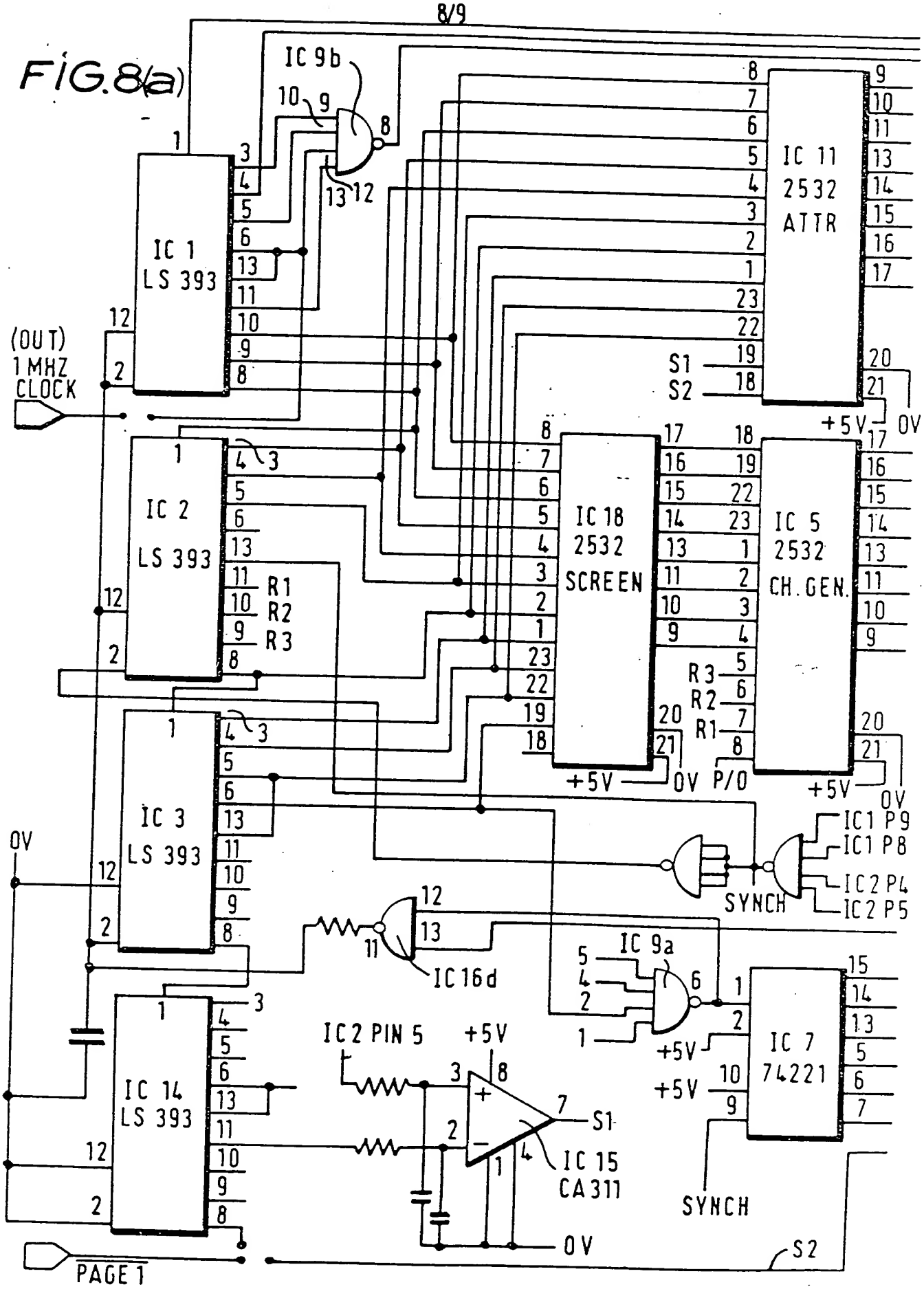
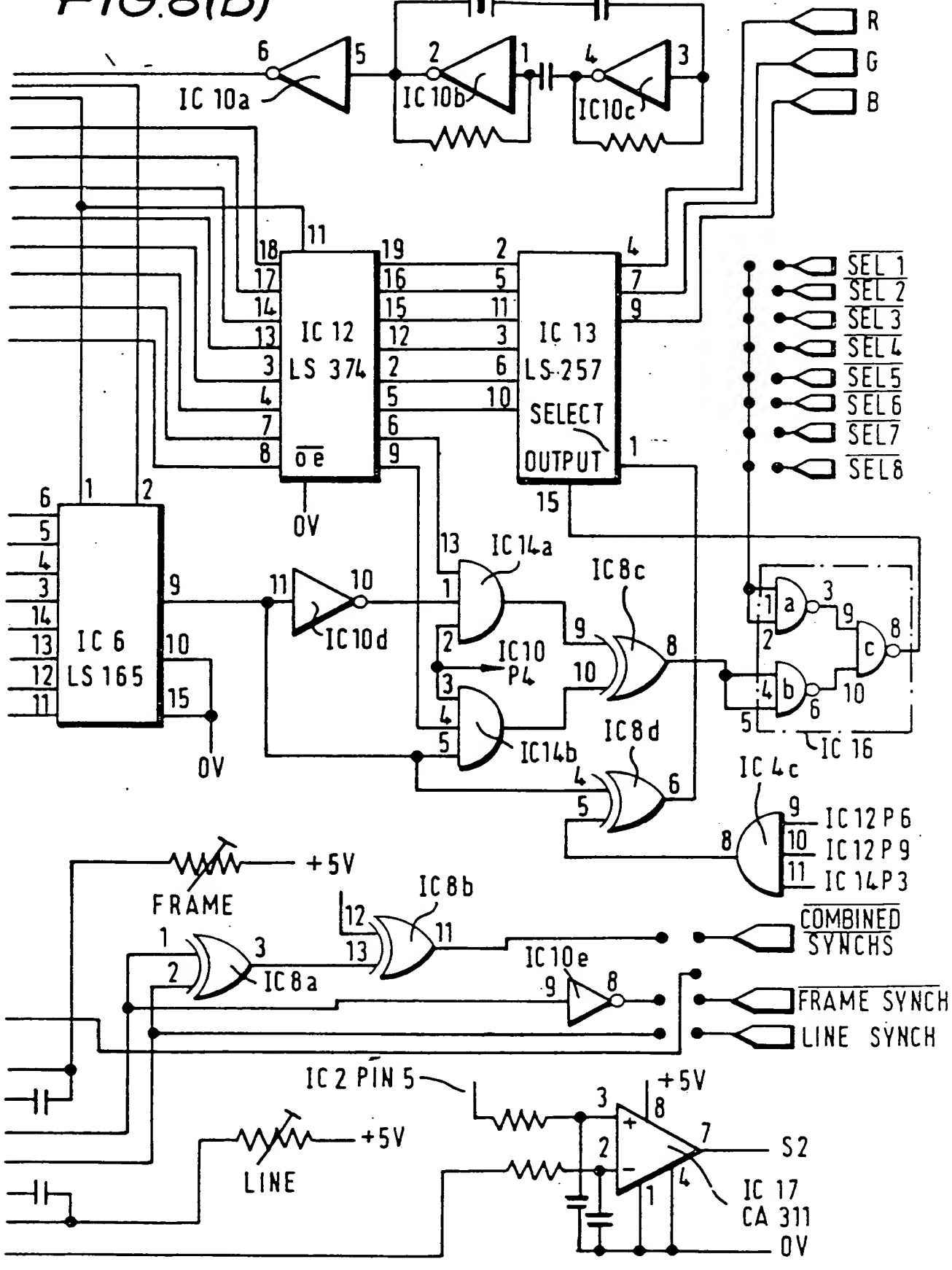

8/9
IC 9b
IC 1
LS 393
(OUT)
1 MHZ
CLOCK
IC 11
2532
ATTR
S1
S2
+5V
OV
IC 2
LS 393
R1
R2
R3
IC 18
2532
SCREEN
IC 5
2532
CH. GEN.
P/O
IC 3
LS 393
IC1 P9
IC1 P8
IC2 P4
IC2 P5
SYNCH
IC 16d
IC 9a
IC 14
LS 393
IC2 PIN 5
IC 15
CA311
IC 7
74221
PAGE 1

FIG.8(b)


IC 10a
IC 10b
IC10c
R
G
B
IC 12
LS 374
oe
0V
IC 13
LS-257
SELECT
OUTPUT
SEL 1
SEL 2
SEL 3
SEL 4
SEL 5
SEL 6
SEL7
SEL8
IC 6
LS 165
0V
IC10d
IC14a
IC14b
IC8c
IC8d
IC10
P4
IC 16
IC4c
IC12P6
IC12P9
IC14P3
+5V
FRAME
IC8b
IC8a
IC10e
COMBINED
SYNCHS
FRAME SYNCH
LINE SYNCH
IC2 PIN 5
+5V
LINE
+5V
S2
IC 17
CA 311
0V

SPECIFICATION

Improvements in or relating to video tape players and pre-recorded cassettes therefor

The present invention relates to a coin operated video tape player or "video jukebox" and also to a graphics unit for supply of still graphics images to the jukebox.

The idea of controlling a video tape recorder so as to retrieve a selected one of a large number of programs located at different positions along the tape and serially following one another is described in U.S. Patent No. 3541271 (Joslow et al). In that system a selection to be played was input by means of a dial to a controller that simply counted cue signals each recorded on the tape to mark the beginning of a selection. Cue-tone based control was also employed in the selective replay apparatus of U.S. Patent Nos. 3601553, 3,601,554 and 3,601,556 (Rak et al, to Bell & Howell Company) in the context of a pre-recorded audio tape cassette.

Finding a particular address in a high capacity tape storage system was further described in U.S. Patent No. 3714382 (Sykes). It was explained that one method of following tape position was by means of a turn counter indirectly attached to one of the tape reels but that this method was of limited accuracy because of slippage resulting in cumulative errors. The alternative method using address signals recorded on the tape was inherently slow because of the need to read the addresses without tape damage or premature wear. The solution taught by Sykes was to coarse position the tape by using a turn counter to permit high speed advance or rewind of the tape to adjacent the desired location and then to fine position the tape by reading encoded addresses in normal play. Particular records on the tape were accessed by a so called dictionary program that on entry of a record title retrieved from memory the address of that record. The Sykes retrieval system was said to be applicable to tape-stored speech, music, television programs, account records or computer programs.

A video tape player with automatic program location intended to add a search capability to pre-existing machines and to facilitate making sales presentations to prospective purchasers of automobiles is described in U.S. Patent No. 3949420 (Older) and was tachometer-based.

U.S. Patent No. 4210785 (Huber et al, to Bell and Howell) described a system for replaying in any selected sequence programs recorded on a tape. The tape was encoded all along its length with frequency shift keyed tones defining binary encoded incrementally numbered positions along the tape and at its beginning had a directory or table of contents that could be read by a tape player and stored in memory. A controller for a video tape player was instructed by means of a keyboard to locate a particular numbered program, after which the tape player was driven in fast forward or rewind to adjacent the start of the desired program with tape movement being monitored by counting Hall effect pulses generated within the tape player, and then returning the player to normal play, after which the player supplies position numbers to the controller so that any minor error in tape position was automatically expunged. But there was no indication in the specification that the apparatus might be further developed and modified for use as a coin-operated juke box machine.

U.S. Patent No. 4,244,644 (Lewis to Videodetics) described another apparatus for controlling a video tape player so that pre-recorded programs could be retrieved and played. The start and stop points along the tape for each selection were stored in memory and means was provided for deriving signals indicating tape motion and direction from a reference point. By counting these signals movement of the tape could be followed and controlled. In fast forward or rewind the tape was driven by a control unit to a position just in advance of the intended selection and it was placed in normal play. An audio cue tone defined the start and end of each selection and could be used to start and stop the transmission of intelligable information from the recorder. But in a video juke box which is intended for frequent use in an environment such as a cafe or public house that is unfavourable from the standpoint of reliable signal detection and equipment performance this kind of position sensing based on relative tape positions has been found to be inadequate. Again there are no directions to modify the apparatus to make it suitable for use as a coin operated video tape player.

A coin operated juke box which is primarily intended for dubbing onto a customer's tape cassette is described in U.S. Patent Nos. 3,990,710 and 4,108,365 (Hughes). But insofar as it envisages the recording of video cassettes, the Hughes apparatus employs separate video recorders for each selection which may be appropriate for the paid recording of a few full length films but is an uneconomic approach towards a juke-box machine.

One requirement in a video juke box that can command wide acceptance is to maintain intellegible information on the monitor screen of the juke-box continuously—i.e. an idle and in tape search modes as well as when the machine is playing a selection, and it is one object of this invention to provide a video juke box that will meet this requirement.

Accordingly the invention provides apparatus for retrieving and playing selected individual sequences of moving pictures comprising:

a tape player operable with a tape having one track for recorded video information, a first audio track for sound to be reproduced with the video information and a second audio track recorded with frequency shift keyed tones defining digitally encoded position numbers incrementing along the tape, said tape player in normal play providing video and audio outputs together with a tones output and in fast forward or rewind providing

output pulses indicating tape motion;

a continuously available source of video information;

a monitor for displaying the audio and video information from the tape player and the video information from said source;

a first random access memory for storing information stream identifies and their start and end position numbers;

input means including a coin mechanism and a keyboard and operable on receipt of a credit to enable identifiers to be supplied corresponding to selections to be played; and

control means operable to cause the monitor to display the video information from the continuous source when the tape player is other than in normal play, operatively connected to the tape player to place it in fast forward or rewind while receiving said output pulses and to place it in normal play while receiving and decoding said tones to derive tape position numbers and responsive to an identifier to compare the current position number with the pertinent start position number from said first random access memory, to move the tape in fast forward or rewind in response to said output pulses to a position before the start of the selected sequence, to place the tape player in normal play and to cause the information stream to be displayed on the monitor while the tape position is between said start and end numbers.

For satisfactory operation in a video juke-box it has been found that positional data for tape search should be provided in the form of an absolute position coding system, recorded all along the length of the video tape itself. A directory should be provided at the beginning of the tape which contains references to the positions of the tracks along the tape. This directory should be initially loaded when the tape is first inserted into the video cassette player. Thereafter the directory should be stored inside a non-volatile memory in the controller circuitry, and subsequently the system is immediately ready for use upon power-up without requiring further access to the tape directory. From there on, the computer can calculate relative offsets to the present position, by using presettable down counters to arrive at the exact position required. As the tape is played back, the stored positional information is automatically updated hence accumulated positional errors cannot impair performance of the unit.

A second requirement in a juke-box that is to be commercially acceptable is to be able to play not only customer-demanded selections entered via a keyboard at random times but operator-demanded selections at predetermined times. In this way advertisements may be placed on each tape and advertising time may be sold on the machine thereby improving the economics of its operation. It is an object of the invention to provide a video tape player that meets these requirements.

In a second aspect the invention provides apparatus for retrieving and playing selected individual sequences of moving pictures recorded along a magnetic tape, comprising:

a tape player operable with a tape having recorded audio and video information in individual sequences spaced apart along the tape;

a monitor for displaying audio and video information from the tape player;

a first random access memory for storing information stream identifiers and their start and end positions along the tape;

control means operatively connected to the tape player to monitor the position of the tape, and on receipt of an information stream identifier to move the tape in fast forward or rewind to the start of the selected information stream and thereafter to place the tape player in normal play;

first selection input means including a coin mechanism and a keyboard and operable on receipt of a credit to supply identifiers corresponding to selections to be played within a first set of said information streams; and

second selection input means including a real time clock and a timer controlled by said clock having memories for selection numbers and times and operable to supply to said control means at predetermined times identifiers for selections to be played within a second set of said information streams.

In a further aspect of the invention it has been found that a video jukebox or like tape player can with advantage be controlled from a plurality of remote data entry points each having a coin mechanism, a keyboard and a simple display. These remote data entry points may take the form of a wallbox units and need only minimal intelligence enabling simple 2-wire connections to the main unit, and thus obviating the need for expensive multi-core cable arrangements as used in the design of many normal jukeboxes. A network arrangement is thus formed with central controller interacting with the satellite processors in the wall units via serial telemetry links.

Thus the invention also provides apparatus for playing a video tape having a plurality of video and audio information stream recorded thereon at spaced locations comprising:

a video tape player,

a main control unit connected to the tape player and operable to receive signals indicative of tape position and to supply command signals to the tape player;

a plurality of selection input units remote from the control unit and arranged to permit a selection identity to be input and to provide a digital serial output of that identity and serial data bus means communicating the several selection input units with main control unit, each selection input unit being enabled in turn to transmit and receive messages to and from the control unit on receipt of an enabling signal from the control unit.

According to a yet further feature of the invention there is provided, for use in association with the aforesaid apparatus, apparatus for switching between pages of graphics memory to

be displayed on a video display device as still images comprising:

a first voltage source that provides a voltage that rises or falls at a low rate related to the rate at which the change over is to take place;

a second voltage source that provides pulses whose maxima and minima are within the amplitude range of the voltage from the first voltage source and which are of a high frequency related to the line scan synchronisation frequency of the video display unit;

a comparator whose inputs receive voltages from said first and second sources and which provides one logic output when the voltage from the first source is greater than that from the second source and the other logic output when the relative voltages are reversed;

memory means including first and second pages of information to be interfaced through data processing means with the video display device; and

selection means responsive to the logic output from the comparator to switch over the memory page being displayed whereby when the first voltage is wholly below or above the voltage amplitude range of the second pulses the first or second page is continuously displayed and as the first pulse voltage passes through said amplitude range each scan line on the video display device consists of a decreasing proportion of information from one page and an increasing proportion of information from the other page.

The said graphics display apparatus is intended for use in combination with a tape player that plays a tape having a plurality of audio and video selections at spaced locations and control means effective to cause the player to play one of the selections on actuation of a selector, and to cause the graphics display to be reproduced when the tape player is idle or in fast forward or rewind mode.

The invention permits the use of a character generator program recorded in an EPROM or other non-volatile memory in combination with a non-volatile memory for text to be recorded on memory pages to be interfaced through a microprocessor to the television monitor, the selection between pages of memory to be displayed being implemented in hardware rather than software. In addition to providing an aesthetically pleasing change-over effect in which successive images pass over the screen in side to side abutting relationship with one or more division lines appearing to "sweep" over the screen, the invention is highly memory-efficient and enables graphics to be generated using a relatively simple and inexpensive graphics card.

The coding system employed is reliant upon data stored in the outer audio track, tape information storage being based on the standard frequency shift keyed CUTS format and utilising an error-checking coding system in the form of data blocks containing multiply redundant information to ensure absolute data integrity. The purpose of this form of data storage is to allow the absolute tape position to be reconstituted so that the machine no longer primarily depends on an estimated tape position and the tape can always be addressed with a high degree of accuracy and reliability. Lack of accuracy has been found to be a problem with other units and this problem has been completely solved in this design. Tape degradation is catered for by the use of multiple redundancy as described above, thus preempting the damaging effects of erosion of the tape oxide surface due to the heavy duty usage anticipated in the operating environment to which these machines are subjected.

The said apparatus is preferably arranged to reproduce and play individual streams of information recorded at spaced locations on first and second video cassettes in first and second cassette players in response to the same input means for information stream identifiers which presents inputs to a common control unit. Control signals are supplied to both recorders from the control unit, and logic means responds to the control signals to each recorder so that only one of the recorders can be in fast forward or rewind and only one of the recorders can be in play at any time. The logic means is also arranged to select identifiers for information streams in different recorders alternately so that while one recorder is playing one information stream the other recorder moves in fast forward or rewind mode to the other information stream. The use of a pair of tape players reduces effective machine down-time and increases the number of selections available.

The continuously available information source may take the form of one or more graphics display memory units connected to the control unit so that the monitor may be caused to display a still graphics image when the signal from the or each cassette player is not being displayed. In these graphics display units the information to be displayed is recorded pagewise in electrically programmable read-only memory as a character map in which a picture map of the screen image corresponding to characters and colour attributes are stored for individual access pagewise. The graphics pages may be arranged to be displayed in order for predetermined times in a predetermined sequence when the machine is in its rest state and also when the or each recorder is seeking for a particular selection in fast forward or rewind mode. It is an advantage of this invention that there is continuity of meaningful image display on the monitor and that the monitor is only switched from graphics display to VCR output display after the beginning of the relevant selection has passed. A delay unit is advantageously operable to cause the second tape player to be placed in a play a predetermined interval after the end of play of the first selection by the first tape player and the control unit causes a still graphics image to be displayed on the monitor whereby each pair of information streams reproduced by the monitor is separated by a still graphics image.

The information means preferably supplies

identifiers to a selection memory having individual addressable counters corresponding to each sequence on the tape and the control means is arranged to read each counter successively, if the contents of the counter are zero indicating no selection to be played to read the next following counter and if the contents are other than zero to decrement the contents by one, to obtain the pertinent start and end positions from the random access memory and to cause the selection to be played. It may further comprise a programmable clock-timer communicating with the control unit and the sequences are divided into a first set that are selectively playable when the machine is in credit by operation of the keyboard and a second set that are played at predetermined times under the control of the clock and timer.

Referring now to the graphics unit, there are normally four images available on the or each colour graphics card which may be arranged to permit simultaneous access to 15 foreground colours and 15 background colours with background control on a character by character basis rather than being an overall simple background colour control as normally found in inexpensive units and provides a flashing capability again on an individual character basis.

The voltage provided by the first pulse source has a rise or fall time appropriate to the fade effect required which will typically be in the range of 0.5 to 5 seconds. The pulses from the second voltage source will normally be at a frequency equal to or twice the line scan synchronisation frequency.

Voltages for the first and second sources may be derived from the outputs of a chain of counters driven by a crystal controlled oscillator. The non-volatile memory means may include locations defining the characters appearing on each page, locations defining the colour of the said characters the address lines of which are fed with clock pulses from the counter chain and locations defining a character generator whose address lines are fed with the output from the character memory, outputs from said character generator being fed to a parallel in serial out shift register. The output from the shift register may be fed together with latched outputs from the colour generator to a multiplexer having a control line operable to turn it on and off by means of high frequency pulses from the oscillator or counter chain so that characters on said page may be displayed selectively at full brilliance or at a fraction of their full brilliance.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Brief description of the drawings

Figure 1 is a diagram illustrating a tape for a tape cassette player bearing a plurality of spaced audio and video information streams and a control track;

Figure 2 is a diagram illustrating the beginning of the tape in the cassette of Figure 1;

Figure 3 is a block diagram illustrating the main features and logic of a video juke box according to the invention;

Figure 4 is a block diagram of a remote selection entry point for use in the video juke box of Figure 3;

Figure 5 is a block circuit diagram of a main control unit for use in association with the video juke box of Figure 3;

Figure 6 is a diagram of a simplified graphics page change device for use in the video juke box;

Figure 7 is a graph of voltage against time illustrating the operation of the device of Figure 6; and

Figure 8 is a circuit diagram of a colour graphics board for use in association with the video juke box of Figure 3 and incorporating a page change device of the kind described with reference to Figures 6 and 7.

Detailed description of the preferred embodiments

In Figure 1 a magnetic tape 10 of a VCR tape cassette bearing a plurality of discrete information streams such as pieces of music and video information to be reproduced severally at will has a track 11 for video signals and a track 12 along which frame synchronisation signals are recorded at a frequency of 25 Hz in normal play mode (generally 3.5 KHz in fast forward or rewind mode depending on the recorder speed). A first audio track 13 carries sound signals to be reproduced in association with the video signals and a second audio track 14 carries digitally coded audio signals denoting absolute position along the tape. The positional information is to be reproduced solely in the normal play mode of the tape and is represented by frequency shift keyed tones of, for example, 1200 or 2400 Hz or 2400 and 4800 Hz denoting binary 0 and binary 1 respectively. Each position t_n along the tape occupies 8 frames of video information corresponding to $8/25^{-1}$ of playing time, this being found to provide a sufficient degree of accuracy for normal purposes, though the number of video frames per position can be increased or decreased if required. The tones are recorded in track 14 so as to provide 48 bits per position divided into three 16 bit words. The first word 16a is a run-in code that recurs at the beginning of each position and it is immediately followed by a second 16-bit word 16b denoting the position and recorded incrementally along the tape. The position word is repeated at 16c, this redundancy together with parity permitting checking of the received location and minimising the loss of information as the tape wears in service. A bit 16 word can define approximately 65,000 separate locations and if each location corresponds to $8/25^{-1}$ of playing time then the available playing time for the tape is six hours which is a sufficient tape length for normal purposes. However, if a longer control period were required the locations could, for example, be extended to occupy 16/25 sec^{-1} of playing time.

At the beginning of the tape there is a lead-in zone of approximately 60 seconds duration during which colour bars are recorded on the video track 11 and a pilot tone is recorded on the audio track 13. The purpose of the lead-in zone is to assist the service engineer in setting up the video cassette recorders and monitor, but there is the additional advantage that in this zone there can be recorded on the track 14 a directory containing information identifying the several different information streams recorded along the tape and associated with each identifier the locations along the tape where that information stream begins and ends. Thus the directory is marking with a machine—recognisable identifier in the form of tones defining in ASCII code a legend such as 'START OF DIRECTORY'. Thereafter the directory contains tones defining in sequence an entry identifier followed by the selection number start position and stop position. The selection identifier may, for example be tones defining in ASCII code the word "SELN" and it is followed by an eight bit word repeated twice and identifying the selection number. There then follows a 16 bit word made up of the first eight significant bits of the start location repeated twice, followed by a 16 bit word made up of the second eight significant bits of the start location read twice. The end location is also defined by two 16 bit words consisting of the first eight significant bits of the end location repeated twice followed by the second eight bits of the end location repeated twice, and it is followed by the selection identifier for the next following selection in the directory. For selection 16 along the tape for example, beginning at address 254A and ending at 2ABC the information recorded on track 14 will be as shown in Figure 2. It will be appreciated that this arrangement lends itself readily to error detection and parity checking in the information read off the directory. Moreover, the whole directory is repeated three times in the lead in zone so that if the information relating to one selection is defective at the first occurrence of the directory or is not properly received due to audiotrack drop-out, it can be picked up on the second or third occurrence. The incremental locations along the tape begin at the far end of the lead-in zone.

A diagrammatic representation of a video juke box in which the tape of Figures 1 and 2 may be used as shown in Figure 3. The machine may be set into operation by means of any of a multiplicity of remote entry points KB_1 to KB_n independent of one another that communicate via a bidirectional serial bus 20 with a main control and multitasking unit 21 that could be a Z80 microprocessor operating in a two state interrupt driven mode allowing transparent operation of the serial bus 20 and incorporating memory mapping for all peripheral interchanges, standardising access methods. The operation of control unit 21 is controlled via line 22 by means of a stored operating program in program memory store 23 provided by U—V erasible EPROMS so as to communicate with the several selection entry points KB_1 to KB_n and handle a pair of video cassette players 24, 25 whose audio and video output can be viewed on monitor 26. The facility of handling two independent VCR's through a single controller is advantageous because the first player 24 can be searching in fast forward or rewind mode for the next selection to be played while the second player 25 is in play mode and vice versa. With this arrangement there will be a relatively small and customer-acceptable delay between selections when the machine is in reasonably frequent use and there is less inherent loss of revenue resulting from unproductive searching time. The control unit 21 also communicates through bidirectional parallel bus 27 with one or more graphics cards G_1 to G_n in which are stored pages of graphics information such as instructions relating to the working of the machine or decorative or advertising material to be displayed on monitor 26 when the players 24, 25 are inoperative or are in fast forward or rewind mode and for this purpose the graphics boards G_1—G_n can be communicated through control unit 21 direct with the monitor 26 to effect display of the selected graphics page. What the graphics boards G_1—G_n contain is a multiplicity of static images to fill the monitor screen pagewise and stored as a character map in EPROMs. Display of these pages successively during idle periods of the machine or while a selection is being located has been found to be unobtrusive over extended periods. Also communicating with the control unit 21 is a clock/timer 28 that is programable to cause selected ones of a predetermined subset of the information streams to be played automatically without customer payment at predetermined times. By this means the machine may be caused to show on demand prepaid advertisement films recorded onto the tape. Thus, the selections on the tape fall into a first group that can be commanded by payment followed by operation of the keyboard and a second group that can be commanded by a real time clock that controls a timer programable with selective number and time for playing.

The entry points KB_1 to KB_n each comprise a coin accepting mechanism 30 that when a coin has been fed enables AND gate 31 to permit a selection entered on numeric or alphanumeric keypad 32 to pass to local control unit 33 from which it can be transmitted though bidirectional parallel to serial converter 34 onto the bus 20 which may be a simple pair of wires. The entry point also includes a display 35 under the control of local controller 33. The entry points are normally inactive but receive one after another transmit request signals from controller 33 through line 20 according to a so-called "bus arbiter" routine. Each entry point then transmits onto bus 20 whether or not it has one or more selections to transmit and if the response is negative the controller 21 will transmit down bus 20 the identity of the selection (if any) currently being played which will then be displayed on display 35. If one or more selections have been

entered through keyboard 32 following insertion of appropriate money in the coin mechanism, they will be displayed on display 35 and at the next transmit request the selection identifiers will be transmitted via converter 34 onto bus 20. The entry point will receive transmit request signals at times typically 0.25 seconds apart so that if there are eight entry points at different locations in a restaurant or bar, they will each receive a request at 2 second intervals which is sufficiently rapid. Instead of the time sharing arrangement described above, a collision detection arrangement can be used, but has been found to be relatively slow when there is more than a small number of entry points.

Transmitted selection identifiers on bus 20 pass to serial to parallel converter 36 and thence to selector decode logic 37 from which the identified selection is used to activate the relevant address lines of look-up table 40 that is connected with control unit 21 by parallel bus 41 for entry of the contents of the directory when a fresh tape is inserted into a player 24 or 25. On receipt of a selection identifier the lock-up table 40 outputs the start and stop locations of the selection into one first-in-first-out register 38 when the selection number is even and into another first-in-first-out register 39 when the selection is odd. The function of the registers 38, 39 is to store the selections in the order of entry and to release them in the same order. The outputs from registers 38, 39 are supplied sequentially via bus 44, 49 to the B inputs to comparator 46 and subtractor 47. When selections are received, the start address of the first selection to be played is loaded via line 44 into the B input of comparator 46 and subtractor 47.

An alternative embodiment (not illustrated) differs in the way that selections are input into the machine. A counter in random-access memory is assigned to each of the selections on the tape and is addressable by the selection number. When a selection identifier has been input from the key-board the pertinent counter is incremented by one. Typically each counter may count up to 4 so that the machine can remember that any particular selection is required to be played on up to four occasions. If there are n selections on the tape there is carried out a selection control routine which consists of reading out in order from 1 to n the contents of each counter. If the contents of counter m ($1 \leqslant m \leqslant n$) equal zero then a pointer in the memory is simply moved to counter $(m+1)$. If the contents are non zero, they are decremented by one and a start and end position for the selection is fetched from a look-up table corresponding to the look-up table 40. With this arrangement selections are played in order along the tape notwithstanding the order that are input to the machine. It is, furthermore, easy to arrange that where there are two tape players controlled from a single control unit, selections from different machines alternate.

In the rest state of the machine the VCR's 24, 25 will last have been in normal play mode. The audio #2 outputs from players 24, 25 that carry the frequency shift key tones go to a common output line 50 that leads to a tone detection and decode unit 51 that provides a digital output significant of the bit signal on track 14 of the VCR to a serial to parallel converter 52 that has registers for storing 16 bit tape position signals and is connected to parallel bus 54 that supplies position signals to the A inputs of comparator 46, and subtractor 47. When the machine is first switched on with tapes in place the initial tape positions on recorders 24, 25 are read from the audio channels 14 via detector and decoder 51 and S/P converter 52 where they are stored in registers for later use. The comparator 46 is supplied at its A input with the current address of the recorder 24 or 25 having the required selection and has an A<B output indicating that a fast forward mode is required, an A=B more indicating that the cassette is positioned at the start or end of the selected information stream and an A>B output indicating that a rewind is necessary. Subtractor 47 has an A—B or arithmetic difference output which is loaded for each fresh selection into a presettable down counter 55. In fact the A—B output is decremented an additional 10 positions in fast forward mode or is incremented ten positions in rewind mode so that the tape is stopped about 2.5 normal play seconds in advance of the start position, thereby masking inaccuracy due to wind-up. The A=B output from comparator 46 is fed to a selection unit 48 that alternates so that at the start of each selection a player to monitor enable signal is supplied through line 42 to control unit 21 and at the end of each selection a signal is supplied to the clock input a bistable 56. The true output $\overline{Q}$ is fed through normally enabled monostable 57 to the PLAY input of the control unit 21. Thus when the monostable 57 is set, a PLAY signal can be transmitted through to the control unit 21. But it may be disabled by a reset signal from the control unit 21 through line 58. The need to do so arises when play of a selection on one of the cassette players 24 has been completed and the selection on the other player 25 has been located and is ready for play. It may be desired that the one selection should not be reproduced immediately after another and by setting monostable 57 through line 58 the PLAY signal may be delayed. This permits one or more pages from a selected one of the graphics units G_1—G_n to be displayed on the monitor 26 between each pair of selections and also permits the second tape player to be brought to the start of its track in normal play while a graphics signal is on the monitor and not a blank screen or unwanted tape signal. The complement output $\overline{Q}$ of the flip flop 56 is connected via line 59 to one input of AND gates 60, 61 that also respectively receive outputs from A>B and A>B outputs of comparator 46 through lines 61, 63 and a time down counter contents not equal to zero output through line 64. The gates 60, 61 will give a true

output via fast forward and rewind lines 65, 66 to control unit 21 when (a) the comparator 46 indicates through line 62 or 63 that a fast forward or rewind operation is required, (b) complement output Q of flip-flop 56 is true indicating that the recorder is not in normal play and (C) the contents not zero output of down counter 55 in line 64 is true indicating that it contains an offset through which the respective video recorder 24 or 25 is to be moved in fast forward or rewind mode to the next selection. Lines 65 and 66 are connected to the fast forward and rewind inputs of control unit 21.

As previously explained the location defining tones in line 60 are only available when a cassette player 24 or 25 is in PLAY mode. When these are in fast forward or rewind modes, therefore, control track frame pulses detected by sensors 70 are passed through pulse shapers 71 to the control unit 21, from which an appropriate signal passes to the down counter 55 through line 72, appropriate frequency adjustment being made having regard to the fact that the number of frames to be traversed is a multiple of the number of positions. Alternatively the compensation could be made in the subtractor 47 and the frame pulses could be passed through line 72 without frequency compensation. The offset output from subtractor 47 is in practice arranged to bring the respective tape about 2.5 seconds in advance of the start position of the desired selection so that the appropriate recorder 24 or 25 can be put into PLAY mode with a still display from graphics units G_1 to G_n appearing on the monitor 26. At the end of the fast forward or rewind the contents equals zero true signal from down counter in line 75 sets flip flop 56 to its Q output true state which gives (via monostable 57) a PLAY signal to control unit 21 and simultaneously disables the fast forward and rewind gates 60 and 61. At the same time player select logic 48 outputs through line 76 a signal indicating which player 24 has the relevant selection. Accordingly an appropriate play instruction appears at line 81 or 85 and the required player 24 or 25 is put into PLAY mode.

Detector and decoder 51 and S/P converter 52 now supply true address signals to the B input of the comparator 46. The start position has been loaded as the A input and when a true signal appears at the A=B output indicating the start of the relevant selection a signal to player selection logic 46 clocks the end position out of the same first-in-first-out store 38 or 39 from which the start position was previously obtained. An output is also given in line 42 to the control unit 21 to cause the monitor display to go from displaying the selected output of graphics boards G_1—G_n to displaying the output from the working video recorder. Under multi-tasking control of the unit 21 the player selection unit now clocks a start location for the next selection to be played from the other end of the first-in-first-out registers 38 or 39 which is presented as a B input to comparator 46 and subtractor 47 that also receives a last address signal relating to the recorder 24 or 25 having the second selection from the register in S/P converter 52. An appropriate fast forward or rewind signal appears on line 62 or 63 and an appropriate arithmetical difference is loaded into the down counter 55, after which the recorder is driven to the indicated location in response to signals on line 72 and stopped ready for play. Comparator 46 continues to look for the end of track A=B condition for the first selection and when this is reached a further signal is supplied to player selection logic 48 that now clocks the play bistable 56 low, stopping the VCR 24 or 25 that was playing the first selection. At the same time logic 48 clocks the start address for the third selection out of the appropriate first-in-first-out store 38 or 39 and this is presented to the B inputs of comparator 46 and subtractor 47. The tape player that played the first selection is now ready to be driven in fast forward or rewind mode to the start of the third selection. The PLAY mode is now available to the second tape player through bistable 56 and monostable 57 but is not initiated until a time has elapsed defined by monostable 57 within which the monitor 26 displays a graphics output from unit G_1 to G_n as described previously. This enables advertising material to be displayed between selections and also maintains an output on monitor 26 while the beginning of the second selection is being found on the second tape player 24 or 25. When the appropriate interval has elapsed, the second tape player is put into PLAY and comparator 46 looks for the A=B condition for the start of the second selection. When the start position has been reached logic unit 48 clocks the end position out of the first-in-first-out store 38, 39 that contained the second selection and the end position is presented through line 49 or 45 to the B input of comparator 46. Play of the third selection on the first tape player which will have been located while the second selection was playing cannot take place until play of the second selection is complete and a graphics display interval has occurred. The cycle is repeated under the control of the control unit 21 until all the selections have been played.

It will be appreciated that the function of the fast forward or rewind control through control track pulse sensors 70 and down counter 55 is to enable the tape to be moved to a ready position in advance of the start position for the required selection.

The actual address then reached can be determined using detector decoder 51 and serial to parallel converter 52 with the player in PLAY mode so that absolute tape position signals are available. In this period the output from one of the graphics units G_1 to G_n will still be supplied to the monitor 26 and the change-over to the tape player output may be caused to take place through line 42 in response to the A=B outputs only when the actual start address of the selected information stream is reached. With this arrangement it does not matter if there is an error in the control track pulse sensing and in the supply of signals to down coutner 55 because the

error will be taken up in the "blank time" after the player 24 or 25 has been put into normal play mode but before its signal is applied to the monitor 26. This method is very reliable and means that the effects of tape wear and wind-up error do not become apparent to the users of the machine because supply of the video signal to monitor 26 is always in response to reaching an absolute tape address and is not dependant on relative tape offset. Furthermore on power on each VCR can be set into PLAY mode to allow the current tape address to be read off, after which the A input information to comparator 46 and subtractor 47 is available and the machine is ready for use.

Because the control unit operates much faster than the cassette players 24 and 25 require control signals, more than one cassette player can be controlled by unit 21 using a multi-tasking program. The illustrated embodiment uses a pair of cassette recorders and there is no reason in principle why additional recorders should not be added, though two recorders will normally give a sufficient number of tape selections and there is no special advantage in having more than two. The control signals in fast forward, play, rewind and stop lines 65, 78, 66 and 77 can be supplied by the control unit 21 either to player No. 1 through a first set of control lines 80—83 or through a second set of control lines 84—87 to player No. 2. But it will be appreciated that with a single down-counter 55 only one of the players should be in fast forward or rewind mode at any time and correspondly only one of the players should be in play mode. Accordingly lines 80, 82, 84 and 86 are connected to AND gates 88, 89, 90 and 91 that receive inputs from NOR gates 92, 93 connected to fast forward and rewind control lines 94, 95, 96 and 97. Correspondingly AND gates 98, 99 that receive inputs from PLAY lines 81, 85 also receive inputs from inverters 100, 101 connected in output lines 102, 103. If player 24 or 25 is in fast forward or rewind mode and a corresponding signal appears on lines 84, 86, that signal will be held until that player is in normal play or in stop and to enable this to be done the controller 21 also receives output signals from NOR gates 92, 93. Correspondingly the control unit 21 receives output signals from the inverters 100, 101 indicating the availability of players 24, 25 to receive a PLAY command.

Lines 105, 106 from the tape players 24, 25 communicate video and audio signals into monitor 26 and lines 107, 108 provide a direct graphics output from control unit 21 and (if desired) an optional tone signal. The pages of graphics information on units G_1 to G_n may be displayed through bus 27, control unit 21 and line 107 on the screen of monitor 26 without the intervention of player 24 or 25.

A block diagram of a practical embodiment of a keyboard control circuit that forms part of each of the data entry points KB_1 to KB_n is shown in Figure 4. The circuit includes as local control unit processor a Z80 microprocessor 33 which is responsible for all the necessary entry point operations—viz, keyboard scanning, display refresh, coin mechanism inputs and serial data bus communication with the main video cassette recorder control unit 21. It is so arranged that, like the control unit 21, there are a number of independent sections of program which can communicate with each other through flags and shared memory segments, forming a three level multi-tasking system. The three tasks include serial bus communications (taks 1), display refresh (task 2) and keyboard/coin mechanism scanning (task 3).

The processor 33 communicates with serial bus 20 through buffer 126 whose output is fed to universal asynchronous receiver/transmitter 116 that communicates with bus 20. A resistor normally pulls the voltage of the bus 20 to logic high and its voltage is pulled low when accessed by a data entry point. As a result, if two or more of the data entry points simultaneously access the bus, no massive currents are drawn and no damage to hardware results. The controller simultaneously transmits a signal through parallel/serial converter 17 and receives the transmitted signal and if the data is found not to have been corrupted it is taken to have been correctly transmitted. Otherwise the data is re-transmitted after a short randomly determined time interval. By this means each data entry point can communicate with the controller 21 through a single pair or wires. Connection between each data entry point and bus 20 may be simply by a wire piercing connector, thus greatly simplifying installation.

A second universal asynchronous receiver/transmitter 127 receives external inputs through a RS232 serial interface 128 can be used for memory testing or testing of the serial interface 117. The receiver/transmitter 117 for serial communication is controlled by a Motorola 6840 counter time that generates the baud rates for the serial bus and also controls parallel input/output ports 128, 129 that control the display 35, receive inputs from the keyboard 32 and also receive switch closure signals from a coin feed mechanism 30.

The serial bus 20 leads to a main control board a practical embodiment of which is shown in Figure 5. It comprises a micro-processor unit 135, NMOS Read Only Memory (ROM) 23, battery backed-up CMOS Random Access Memory (RAM) 38, 38, 40, a high reliability FSK data storage/retrieval system (for encoding and decoding absolute time code signals), an external multipath serial communications link for off-board data interchanges, a digital counter/timer 137 for general timing signal generation and tape location usage and, finally, a large number of parallel input/output lines 140 for control purposes.

The micro-processor unit 135 is a Z80 micro-processor operating in a two state interrupt drive mode allowing transparent operation of the serial bus 20 described above. The design of the control unit incorporates memory mapping via address decoder 141 for all peripheral interchanges, e.g.

with keyboards KB_1 to KB_n and graphics units G_1 to G_n thereby standardising access methods. The read only memory 23 consists of 2716 and 2732 U.V. erasable ROM integrated circuits configurable for up to 8K bytes of program storage range. The non-volatile random access memory 38—40 provides stacking area for the processor 135 in addition to storing the directory of video tape positional information (described above) and other necessary information. Whenever a new video tape is introduced to the system, the contents of the directory (which appears at the beginning of the tape) is down loaded via the processor 135 into the memory 38—40 and since the memory is non-volatile, this positional information remains available to the microprocessor 135 at any time after subsequent power-up of the machine, obviating the need to repeatedly reload the directory. The memory area 38—40 may also be used for the storage of statistical information concerning the frequency of video track access. A computer user tape standard storage (CUTS) interface 57, converts serial audio data from the tape players in standard frequency shift keyed CUTS format into TTL level serial data suitable for input directly into a universal asynchronous receiver/transmitter that acts as a serial-parallel converter 52.

A hunter program recorded in memory 23 provides the functions of comparator 46, subtractor 47 and down counter 55 and can be used by processor 135 to locate a target position on the tape. It provides for histogram storage of the previous sixteen tape locations determined by player 24 or 25 when in PLAY mode allowing checking for sequentiality of a position just read with the last sixteen received tape positions, so that if an erroneous tape position manages to bypass error detection routines stored in memory 23 then this erronious tape position will have no effect on the playing of video tracks.

The control unit 135 communicates with the keyboards KB_1—KB_n via serial communications link 119 which is a universal asynchronous received/transmitter 36 which is connected through an interface 137 to serial bus 20. The counter-timer 137 is connected to universal asynchronous receiver-transmitters 36 and 52 that control the baud rates of the computer user tape standard interface 51 for the VCR and the interface 137 for the serial communications line 20. It also operates as the digital described above.

Parallel input/output ports 140a communicate with the control system for the video cassette recorder/players 24, 25 and can be used to transmit control commands. Ports 140b are intended for general purpose parallel communication with the processor 135 and ports 140c are used for an internal parallel bus system connected, for example to one or more graphics display boards described below. It will be appreciated that in addition to information from the player 21 the controller shown in Figure 5 might also be operable to receive audio and video signals from direct or satellite television transmissions or sent via cable and to cause them to be displayed on the monitor 26.

Figure 6 shows a simplified page change unit for incorporating into the graphics units G_1 to G_n of Figure 3. A source 210 of triangle pulses operates either continuously or when it is entended to change from one page to another, the pulses having an amplitude of, say 0 to +5 volts and a time constant appropriate to a visibly perceptible "fade" effect, say 0.5 to 5 seconds, typically 2—3 seconds. A second pulse source 212 supplies pulses of frequency related to the line scan synchronisation frequency of the intended monitor unit and of amplitude within the amplitude range of the pulses from source 210, typically from +1.25 volts to +3.75 volts. Pulses from source 210, 212 are fed through respective integrators 213, 214; 215, 216 to the A and B input terminals of comparator 217. The output of the comparator is logic 1 if B<A, in which case a signal to the control line of memory 218 that stores a first page to be displayed enables a page of alphanumeric graphics characters stored in the memory to be read through lines 219. A second page to be displayed is stored in memory 220 the control line of which is connected to the output of comparator 217 via inverter 221. Thus while the output of comparator 217 is logic 1 no data is read through lines 222. But when the output of comparator 217 is logic 0, no data is read through lines 218 and memory 220 is enabled via its control line to output the second page through lines 222.

The way in which the circuit of Figure 6 operates can be understood from Figure 7, which is a graph showing voltage against time for the pulse sources 210, 212 (the chain dotted and the solid lines respectively) together with the output waveform from comparator 217. In the time interval t_1 the voltage from source 212 and the output from comparator 217 is logic 1. Then in the period t_4 the voltage from source 212 is above the voltage from source 210 for an incrementally increasing proportion of the period of the pulses from source 212 and the output from comparator 217 is a train of logic 1 pulses in which the logic 1 value is maintained for a reducing proportion of the total time. Then in t_5 voltage from source 210 remains below the voltage from source 212 and the output is logic 0. The cycle then restarts. So the output from comparator 217 is a square wave whose duty cycle varies from 100% to 0%. The output waveform switches between memory 218 and memory 220 their contents are used to modulate the brilliance of the spot traversing the monitor screen 26 (Figure 3) during proportions of the line scan defined by the time that the output of comparator 217 is logic 0 or logic 1. The monitor 26 displays the first page and the second page during t_1, t_5 and t_3 and during t_2 and t_4 sees portions of both pages traversing the screen. The signals for pulse sources 210, 212 may be derived from timing counters that also provide line synchronisation and in this case they

are easily and automatically tied to the line scan synchronisation frequency.

The visual effect depends on the actual frequency relationship between the pulses at source 212 and the line scan synchronisation frequency. If they are equal, a division line between the two pages which are in side by side relationship traverses the screen. If the pulses at source 212 are twice the line scan synchonisation frequency there are two division lines that sweep from the sides of the monitor screen towards its centre. Other frequency relationships are possible but these two relationships give preferred change-over effects. And if the waveform at source 210 were a simple sawtooth instead of a triangle waveform there would be a fady type changeover when changing between the first and second pages and an instantaneous change-over in the reverse direction. The source 212 waveform has been shown as cyclical but it could be arranged to be stable in its high or low values and caused to change over only on actuation of a switch.

Figure 8 shows a practical embodiment of the invention in a colour graphics board for connection to the parallel bus 27 (Figure 3). A 16 M Hz crystal controlled oscillator is formed by IC 10b and IC 10c which are 74S04 inverters interconnected by a capacitor and the quartz crystal in a feedback loop. Its output is fed to inverter IC 10a which is also a 74S04 inverter that acts as a buffer chip that provides a 16 M Hz square wave output to a chain of 8 bit dividers IC1, IC2, IC3 and IC14 which are LS393 counters. Outputs of these are tapped off via IC7 which is a 74221 dual astable multivibrator and gates IC8a and IC8b to form standard inverted frame, line and combined synchronising signals for the monitor 26.

IC18 is a 2532 EPROM that in this instance contains text for two memory pages, either of which is to be displayed on the screen of monitor 26, though four or more pages could be present if desired with additional memory capacity. Each character in the pages is defined by two 8 bit words, the first 8 bits defining character identity, the next three bits defining foreground colour, the next three bits background colour and the last two bits whether or not the character is to be displayed with flashing or at half brilliance. Each page typically contains up to 15 lines of each of up to 25 characters. A further 2532 EPROM, IC11, stores colour information for the two pages. The two ERPOMs may be programmed by a separate microcomputer and EP4000 programmer or may have been copied from a master programmed EPROM by a mass copier. The address lines of EPROMs IC11 and IC18 are fed with outputs from dividers IC1, IC2 and IC3 of the counter chain. The output from screen or test EPROM IC18 is fed to IC5 which is a further 2532 EPROM that acts as a character generator and contains the allowable character set. The character generator works using the conventional television scan line pattern of the monitor 26, characters being defined in 8 scan lines by an 8 by 8 or 8 by 16 dot pattern. Since there are 25 line characters, the character addresses in each line are accessed by address lines 18, 19, 22, 23 and 1 of IC5 which are clocked by the output at pins 10, 9 and 8 of IC1 and 3 and 4 of IC2 which are of high frequency. Only 25 of the 32 available addresses are used, the remaining addresses being left blank and corresponding to the beam spot flyback time. Lines 2, 3 and 4 of IC5 clocked by output at pins 5 and 8 of IC2 and pin 3 of IC3 define the spot scan line within each line of characters to be displayed. And address lines R_3, R_2 and R_1 which are clocked directly from pins 9, 10 and 11 of IC2 specify the line from top to bottom of each page in which the characters are recorded. Dot patterns in the 8 by 8 matrix corresponding to particular characters in the available character set are also recorded in IC5. Output from IC5 is fed into IC6 which is an LS165 parallel in serial out shift register, the serial outputs from pin 9 being fed via inverter IC10 and gates IC4a, IC4b to gate IC8c and board select logic IC16 a-c operated by signals from bus 27 to IC13 which is an LS257 multiplexer. Colour information from IC11 passes to IC12 which is an LS374 chip that acts as a latch. The output from IC13 is a red (R) green (G) Blue (B) output that can be supplied on bus 27 to control unit 21 and can be used as the input signal on lines 107, 108 for the colour television monitor 26.

A 16 M Hz output from pin 4 of IC10c may be supplied to gates IC4a and IC43b, the effect of which is to switch multiplexer IC13 on and off at the oscillator frequency. As a result either the whole page or selected paragraphs may be displayed at half brilliance.

"Fading" during page change-over is achieved by using the output at pin 11 of IC14 which changes state every 3—4 seconds (though other outputs and rates are available). This output is integrated via 1KΩ resistor and a 470 μF capacitor and is supplied to the negative input 2 of IC15 which is a CA311 comparator. The output at pin 7 from IC15 is square wave whose duty cycle varies from 100% to 0% as explained above. The positive terminal of IC15 is connected to pin 5 in IC2 that provides a square wave output at a frequency related to the line scan synchronisation frequency, which is easy to arrange because the output is tapped from the same chain of counters that provides the line scan synchronisation frequency. The 4700 pF capacitor and 10K resistor are selected to produce an almost triangle wave at the line synchronisation frequency whereas the 1K resistor and 470 μF capacitor determine the fade time. The output from IC15 is supplied to memory chips IC11 and IC18 to bring about the page change. IC17 is similar to IC15 but is used to switch between third and fourth pages in a four page variant of the system.

It will be appreciated that modifications may be made to the embodiment described above without departing from the invention, the scope of which is defined in the appended claims.

Claims

1. Apparatus for retrieving and playing selected individual sequences of moving pictures comprising:

a tape player operable with a tape having one track for recorded video information, a first audio track for sound to be reproduced with the video information and a second audio track recorded with frequency shift keyed tones defining digitally encoded position numbers incrementing along the tape, said tape player in normal play providing video and audio outputs together with a tones output and in fast forward or rewind providing output pulses indicating tape motion;

a continuously available source of video information;

a monitor for displaying the audio and video information from the tape player and the video information from said source;

a first random access memory for storing information stream identifiers and their start and end position numbers;

input means including a coin mechanism and a keyboard and operable on receipt of a credit to enable identifiers to be supplied corresponding to selections to be played; and

control means operable to cause the monitor to display the video information from the continuous source when the tape player is other than in normal play, operatively connected to the tape player to place it in fast forward or rewind while receiving said output pulses and to place it in normal play while receiving and decoding said tones to derive tape position numbers and responsive to an identifier to compare the current position number with the pertinent start position number from said first random access memory, to move the tape in fast forward or rewind in response to said output pulses to a position before the start of the selected sequence, to place the tape player in normal play and to cause the information stream to be displayed on the monitor while the tape position is between said start and end numbers.

2. Apparatus according to Claim 1, wherein the tape player is operable with a cassette in which the tones define numbered positions spaced 8 or 16 video frames apart along the tape.

3. Apparatus according to claim 2 wherein each position is defined by a sequence of frequency shift keyed tones recorded at 1200 Hz and 2400 Hz or 2400 Hz and 4800 Hz at the normal tape playing speed.

4. Apparatus according to claim 3 wherein each position is defined by a block of tones having a first section in which a fixed sequence identifies the beginning of the block, a second section in a variable sequence denotes the position number and a third section in the same sequence as in the second section repeats the position number.

5. Apparatus according to claim 4 wherein there is a lead-in section at the beginning of the tape in which the video track carries a test signal, the first audio track carries a pilot tone and the second audio track carries at the start of the tape tones defining a directory repeated at least twice and defining each sequence and its start and stop positions, the control means operating when a tape is first inserted into the machine to rewind the tape, read the directory in normal play and store decoded information stream identifiers and their associated start and stop positions in the random access memory.

6. A video tape cassette according to Claim 5 wherein the directory is defined by a sequence of tones defining an entry flag word followed by an entry identifier repeated twice, the first significant digits of the start position repeated twice, the second significant digits of the start position repeated twice, the first significant digits of the end position repeated twice and the second significant digits of the end position repeated twice.

7. Apparatus according to Claim 1 arranged to reproduce and play individual streams of information recorded at spaced locations on first and second video tapes in first and second tape players in response to information stream identifiers presented as inputs to common control means operatively connected to both recorders, and including logic means arranged so that only one of the recorders can be in fast forward or rewind and only one of the recorders can be in play at any time and arranged to select identifiers alternately for information streams in different recorders so that while one recorder is playing one information stream the other recorder moves in fast forward or rewind mode to the other information stream.

8. Apparatus according to Claim 7 wherein the continuously available video source is one or more graphics display memory units connected to the control unit so that the monitor is caused to display a still graphics image or one of a sequence of still graphics images recorded on different pages of a programmable read-only memory to be displayed in turn when the signal from the or each cassette player is not being displayed.

9. Apparatus according to claim 8 further comprising a delay unit operable to cause one tape player to be placed in play a predetermined interval after the end of play of a first selection by the other tape player and the control unit causes a still graphics image to be displayed on the monitor while the delay unit operates whereby each pair of information streams reproduced by the monitor is separated by a still graphics image.

10. Apparatus according to claim 1, wherein the input means supplies identifiers to a selection memory having individually addressable counters corresponding to each sequence on the tape and the control means is arranged to read each counter successively, if the contents of the counter are zero indicating no selection to be played to read the next following counter and if the contents are other than zero to decrement the contents by one, to obtain the pertinent start and end positions from the random access memory and to cause the selection to be played.

11. Apparatus according to claim 10, further comprising a programmable clock-timer communicating with the control unit and the sequences are divided into a first set that are selectively playable when the machine is in credit by operation of the keyboard and a second set that are played at predetermined times under the control of the clock and timer.

12. Apparatus for playing a video tape having a plurality of video and audio information streams recorded thereon at spaced locations, comprising:

a video tape player,

a main control unit connected to the tape player and operable to receive signals indicative of tape position and to supply command signals to the tape player;

a plurality of selection input units remote from the control unit and arranged to permit a selection identity to be input and to provide a digital serial output of that identity; and

serial data bus means communicating the several selection units with the main control unit each selection input unit being enabled in turn to transmit and receive messages to and from the control unit on receipt of an enabling signal from the control unit.

13. Apparatus according to Claim 12 wherein the voltage on the data bus is high in its no-signal state and is lowered when one or more keyboards transmits a signal.

14. Apparatus according to claims 13 wherein each selection input unit comprises a coin mechanism, a keyboard and a display electrically connected through parallel input/output ports to a microprocessor local control unit, data passing from the unit through bidirectional parallel to serial data conversion means to the parallel bus.

15. Apparatus according to claim 14 wherein the intended tape cassette has absolute position information recorded thereon in an audio track and the main control unit is arranged to receive and decode the absolute positional information when the player is in normal play mode.

16. Apparatus for switching between pages of memory to be displayed on a video display device comprising:

a first voltage source that provides a voltage that rises or falls at a low rate related to the rate at which the change over is to take place;

a second voltage source that provides pulses whose maxima and minima are within the amplitude range of the volute from the first voltage source and which are of a high frequency related to the line scan synchronization frequency of the video display unit;

a comparator whose inputs receive voltages from said first and second source and which provides one logic output when the voltage from the first source is greater than that from the second source and the other logic output when the relative voltages are reversed;

memory means including first and second pages of information to be interfaced through data processing means with the video display device; and

selection means responsive to the logic output from the comparator to switch over the memory page being displayed whereby when the first voltage is wholly below or above the voltage amplitude range of the second pulses the first or second page is continuously displayed and as the first pulse voltage passes through said amplitude range each scan line on the video display device consists of a decreasing proportion of information from one page and an increasing proportion of information from the other page.

17. Apparatus according to Claim 16 wherein the voltage provided by the first pulse source has a rise and/or fall time of 0.5 to 5 seconds.

18. Apparatus according to Claim 17 wherein the pulses from the second voltage source are at frequencies equal to or twice the line scan synchronisation frequency.

19. Apparatus according to any of Claims 16 to 18 wherein the voltages for said first and second sources are derived from outputs of a chain of counters driven by a crystal controlled oscillator.

20. Apparatus according to Claim 19 wherein the memory means includes locations defining the characters appearing on each page, locations defining the colour of the said characters the address lines of which are fed with clock pulses from the counter chain and locations defining a character generator whose address lines are fed with the output from the character memory, outputs from said character generator being fed to a parallel in serial out shift register.

21. Apparatus according to Claim 20 wherein the outputs from the shift register are fed together with latched outputs from the colour generator to a multiplexer having a control line operable to turn it on and off by means of high frequency pulses from the oscillator or counter chain so that characters on said page may be displayed selectively at full brilliance or at a fraction of their full brilliance.

22. Apparatus for retrieving and playing individual sequences of moving pictures recorded at spaced locations on video tape cassettes each having a track recorded with spaced moving picture sequences, a track for video control pulses and an audio track having streams of sound information to be reproduced with each moving picture sequence comprising:

(a) input means for information stream identifiers;

(b) first and second cassette players arranged to read the information recorded on first and second cassettes in a normal play mode and to advance and rewind the cassettes in high speed modes;

(c) a monitor for reproducing video and audio information from the cassette player;

(d) a random access memory for storing information stream identifiers and their associated start and stop position numbers along the tape;

(e) means associated with each tape player for detecting when the player is in normal play mode tones defining incrementally numbered digitally

coded positions along the tape recorded on another audio track and deriving the tape position numbers;

(f) means for producing output pulses corresponding to detected video control track pulses when the player is in its high speed advance and rewind modes;

(g) multi-tasking logic means that for each tape player alternately when presented with the current tape position and the start position supplied by the random access memory of a selection next to be played outputs a signal to cause the tape player having that selection to make a fast forward or rewind tape movement and presents a difference signal corresponding to the distance the tape is to move to counter means that is incrementally changed as control pulses are received and signals when the tape has been displaced the required distance to logic means to stop the recorder and place it in normal play so that while one player is in normal play the other player may be caused to search for the start position of the moving picture sequence next to be played.

24. Apparatus for retrieving and playing selected individual sequences of moving pictures recorded along a magnetic tape, comprising:

a tape player operable with a tape having recorded audio and video information in individual sequences spaced apart along the tape;

a monitor for displaying audio and video information from the tape player;

a first random access memory for storing information stream identifiers and their start and end positions along the tape;

control means operatively connected to the tape player to monitor the position of the tape, and on receipt of an information stream identifier to move the tape in fast forward or rewind to the start of the selected information stream and thereafter to place the tape player in normal play;

first selection input means including a coin mechanism and a keyboard and operable on receipt of a credit to supply identifiers corresponding to selections to be played within a first set of said information streams; and

second selection input means including a real time clock and a timer controlled by said clock having memories for selection numbers and times and operable to supply to said control means at predetermined times identifiers for selections to be played within a second set of said information streams.

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